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Creativity, Adaptability, Transition: Advancing Sustainable Development in the Built Environment through Transdisciplinary Architectural Design

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INTRODUCTION

The link between creativity, design thinking, and interdisciplinarity has been explored by Darbellay et al. (2017). They proposed that the three dimensions are not contradictory, but instead, they form triadic-feedback loops that cannot be resolved in a unified synthesis. This triadic model underscores that, in fact, the creative, interdisciplinary (or transdisciplinary) design thinking is an outcome of dialectic, or even dialogical (Lybeck, 2010), processes among disciplines, stakeholders, the problem at hand, and the variety of possible design solutions. Harvey (2014) proposes that this type of creative synthesis can only generate breakthrough ideas if it integrates multiple understandings for the same problem. Specifically, in Harvey's (2014) model, breakthrough ideas require a context where ideas are enacted, similarities are built upon, and collective attention is secured – and it is only through a sort of reflection in action (Schön, 1984) that creative synthesis can generate exemplars that are iteratively improved until breakthrough.

With global population growth and urbanization trends rising (Department of Economic and Social Affairs (Population Division), 2017; United Nations - Department of Economic and Social Affairs Population Division, 2018), it is now imperative that we move towards a state of creative sustainability in the built environment. The publication of the 2030 Agenda and the sustainable development goals (SDGs) (United Nations, 2015) has signalled a new course for practitioners, scholars, and designers by institutionalizing a more comprehensive understanding of sustainable development, which is supported by clear targets and indicators (Pedersen, 2018). While the SDGs are global in scope, their application requires action to be taken on individual project levels, including building projects, on the local scale (T. Walker & Goubran, 2020). Most importantly, the SDGs enabled sustainability action to remain reliant on the interpretation of the problems, along with the framing of the design problem (Goubran & Cucuzzella, 2019). Thus, it can be argued that the SDGs have reframed the sustainable built environment challenge as a complex design problem, open for interpretation, judgment, and theorization and leading to multiple solutions and innovations (Nelson & Stolterman, 2012), that requires the synthesis of knowledge between a multitude of disciplines (Kroes et al., 2008).

In this paper, we argue that architecture, as a field of research and practice, is both inductive and inclusive of the creative transdisciplinary approaches needed to tackle sustainable development challenges in the built environment (Goubran, 2018). The paper presents a theoretical development, followed by a synthesis supported by published case studies. In essence, the paper capitalizes on the value of architecture as a

transdisciplinary field that allows for transformative sustainable practices within the building and construction industries. Thus, it establishes a scheme where architectural design, as a transdisciplinary field, is an inclusive thinking process that has the potential to push boundaries of “just building” to “building for”.

CREATIVE TRANSDISCIPLINARITY THROUGH ARCHITECTURE

As early as 1970, interdisciplinarity was recognized as a possible solution to the Twenty-First-Century challenges (Crabbé, 2019). Interdisciplinary activities are often qualified as being transformative, innovative, and creative (Darbellay et al., 2017). Crabbé (2019) proposes that today, there is a move towards transdisciplinarity, where the shift from inter- to trans- disciplines can be achieved by involving a large scale of stakeholders (e.g. Individuals, NGOs, educational institutions, and private companies). It is essential to highlight that inter or trans-disciplinarity is not anti-disciplinary but a process that aims to overcome the over-specializations observed in the academic fields (Bursztyń & Drummond, 2014). Of course, this notion of transdisciplinarity has already been studied theoretically by Max-Neef (2005) and others – indicating that a strong transdisciplinarity is marked by a break from the traditional linear and deductive logic (Sabre, 2018) to allow for new and multiple realities that are embedded in complexity (Morin, 2008). Nevertheless, Andersen (2013) proposes that these new transdisciplinary epistemes can only be substantiated through the established disciplines.

Mies van der Rohe once said, “Architecture starts when you carefully put two bricks together. There it begins.”. This type of sensitivity to aesthetics, beauty, and order distinguishes architects and possibly embeds the process of designing buildings in the arts. Jacobs (2018) proposes that artistic thinking offers many advantages and strengths. Namely, they highlight metacognition, prolonged research, problem-creating, delaying closure, reflection, thematic coherence, emotional engagement, and intuition as essential art-domain dominant cognitive strategies and mindsets, which architects often practice. Specifically, problem-creating and problem-setting are key to innovation and creativity, where sometimes redefining or interpreting the problem from different perspectives can lead to breakthroughs (Harvey, 2014) by navigating ill-defined problems towards a satisfactory resolution. Cross (2018) also proposes that the process of designing requires a commutative relationship between problem and solution and between problem and sub-problems. Also, the relationship between a design and an artefact becomes contingent on application and technique (Love, 2002).

Kroes et al. (2008) propose that architects view that design excellence depends on creative synergy; in other words, the outcome of a process that is similar to that described by Harvey (2014). Architects tend to expand the design scope and go beyond the everyday. They also indicate that excellence in architecture can only happen through the integration of a multitude of stakeholders and careful consideration of their needs: “At its best, value-sensitive-design is not simply the accommodation of local values in the designers’ vision of the future, but a transactional process in which designers and citizens depend upon each other’s knowledge in the production of a better world” (Kroes et al., 2008, p. 14). This highlights how architecture, or good architecture, can only be practised transdisciplinary. Cavanagh (2008) also highlights that all artefacts, especially those in the built environment, ought to be described both technically and techno-socially – highlighting that in the building sector, design should always address functionality, which is open to the social context.

Perhaps the critical foundation that makes architecture an appropriate design field of synthesis is the ability of architects to engage with the design situation emotionally and use their intuition or judgment (Chupin, 2011; Welch, 1984) to make decisions and arrive at the needed compromises. As suggested by Muratovski (2017, p. 13), designers, including architects, today should “not only [be] aesthetically sensitive, but also culturally aware, inquisitive, [...] [and] able analyze problems and organize information related to how people interact with information, technology, knowledge, cultures, environments, objects, and society”. In the context of sustainable development and sustainability in the built environment, this sometimes entails negotiating between the social, economic, and environmental pillars and between the inputs of different stakeholders, be them citizens or experts, requiring the prioritization of specific SDGs on the social-cultural and economic context.

Through this theoretical exploration, it is safe to postulate that architecture, as a field of design research and practice, is fit for accelerating sustainable development in the built environment. In a sense, architecture practice can adapt to the external conditions, addressing short-term needs and adapting to consider the longer-term challenges (Goubran, 2018). Figure 1 illustrates this framework.

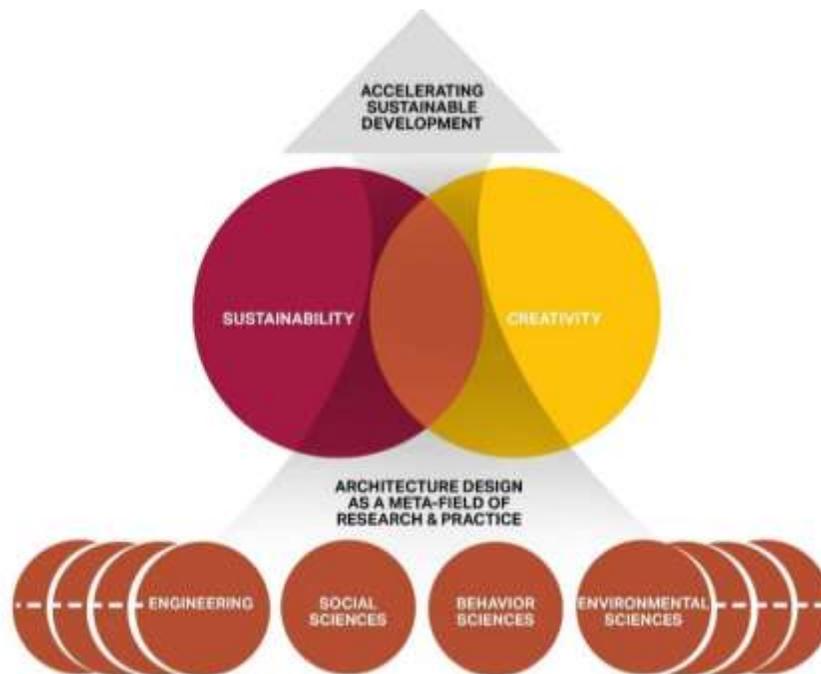


Figure 1. Architecture design as a meta-field of design research and practice for accelerating sustainable development in the built environment

ARCHITECTURE AS A FACILITATOR OF TRANSDISCIPLINARY SUSTAINABLE DEVELOPMENT

Sustainability is often perceived as a challenge at the intersection of the social, economic, and environmental dimensions (Walker, 2015). When it comes to sustainability in the built environment, multiple disciplines that make up the research and practice of the building sector (architecture, design, engineering, environmental sciences, social sciences, behaviour sciences, to name a few) often offer

competing approaches and processes. It can be argued that architecture is well-positioned to mediate between these disciplines and optimize their contribution, intersecting sustainability and creativity through transdisciplinarity, thereby accelerating sustainable development in the built environment.

Defining transdisciplinary in architecture is not, so far, put into one specific definition, but can be most commonly defined as the coordination and integration among different disciplines that relate to the built environment, not just merely the interaction among them (Bursztyn & Drummond, 2014). The value of creative transdisciplinarity in the design field arises from its ability to cope with the complex societal problems of the contemporary world, thus becoming an agent of change and moving towards sustainable adaptive futures. Several publications (such as Fei et al., 2021; Goubran, 2019; Wen et al., 2020) have examined the interactions between buildings and the SDGs. Other publications, such as the UIA guides (Institute of Architecture and Technology (KADK) et al., 2018, 2020) have documented examples of architecture that address or link to some of the SDGs. However, these investigations have focused less on uncovering the transdisciplinary design that merges creativity and sustainability principles to realize these designs. The following paragraphs highlight how creative transdisciplinarity through architecture can contribute to the SDGs and deeply address sustainable development concerns (Cucuzzella & Goubran, 2019) of the design solutions presented.

When defining the core value of sustainable thinking in architecture, the cultural dimension was defined a central aesthetic of sustainability. Sustainability, in that sense, could be approached as an effort to reach alternatives and patterns that connect dimensions of reality. This includes economic, social, political, cultural, and ecological aspects of a given context (Kagan, 2011). In a reductionist sense, the power of the architectural design thinking process lies in its aesthetic question of “How are you related to this creature? What pattern connects you to it?”. This integral merit is embedded in the process of design thinking that gives attention to the network of interrelationships in our environment that makes the architecture of great potential in respecting natural and social processes of its context (Kagan, 2011). David Schlosberg discussed another integral aspect of architecture in analyzing architecture as a pluralistic act that demands engagement across the different disciplines, including building design, building science, social science, and industrial ecology, and realizes the relationship of human beings and their surroundings (Guy & Moore, 2007).

Here, we propose that architecture allow design teams to move beyond managing risks and reducing harms to creating new values in the built environment with transformative potential (Baue, 2019). The environmental tools and standards developed for the environmental-harm-reduction endeavour, reinforced by technology (Tarkhan, 2020), have proven helpful in institutionalizing green building practices in the building and construction industry (Jones & Laquidara-Carr, 2018). However, they have shown a diversity of limitation when it comes to the broader focus of sustainable development and is still seen as unable to capture the complexity of sustainability (Cucuzzella, 2015; S. Walker, 2006). From a design-thinking perspective, more experimental approaches that move beyond mitigating known risks and focus on creating value are needed to realize concrete development outcomes (Cucuzzella & Goubran, 2020; Goubran, 2021). In the following section, we present a series of published cases that highlight how creative transdisciplinarity through architecture can contribute to the SDGs¹.

¹ Case studies are taken from (Institute of Architecture and Technology (KADK) et al., 2018, 2020)

CREATIVE TRANSDISCIPLINARITY'S CONTRIBUTIONS TO THE SDGS THROUGH ARCHITECTURE

In Kenia, to provide educational and vocational support, a children's home was designed to address that half of the women population is below the poverty line. Women could participate in the project construction, thus learning the skill and acquiring economic independence. This project realizes SDGs 1,2,5,8,10, &11 through capitalizing on a spectrum of economic, sociological, behavioural, and architectural aspects that could attain the sustainable development of the neighbourhood.

In Burkina Faso, the exchange concept was used to elevate its literacy rates through a "centre for sustainable building technology". The centre is designed to be an ongoing dialogue, a continuous learning experience, among local artisans, craftsmen, engineers, architects, students, and visitors to inaugurate and study building methods. The design is planned and built to realize the transdisciplinary asset that the built environment offers, allowing for a creative exchange between tradition and contemporary building methods.

A recreational park, designed in China amid the natural wildlife, addresses the immense modern-day challenge of balancing between natural life preservation and intervention. The architectural design had to be coupled with ecological measures and studies to avoid harming the natural ecosystem, considering, simultaneously, the physical and mental health demands of the people while experiencing the park.

These cases demonstrate that the SDGs can be addressed when the built environment is addressed from a creative transdisciplinary design lens, a scheme similar to Christopher Alexander's (1968) systems thinking approach, where transdisciplinary and innovative design strategies can accelerate sustainable breakthroughs.

The above case studies showcase some of the principles of architecture as an approach to attain harmony within an environment, a type of harmony with the people, the surroundings, the ecology, the culture, and, even, the technology of a given time and place. The value of architecture as a transdisciplinary field of study and practice is manifested to be one that:

- Gives attention to the network of interrelations in a given context
- Is in harmony with the context of ecological, social, historical, biological, and economic forces
- Preserves and restores the damages within a society
- Capitalizes on the resources and capacities of the context
- Establishes possibilities of co-existence

Thus, these principles would allow for a responsive design process and an output that is in harmony with the contemporary challenges of the built environment.

These published global cases show how creative architectural design solutions contribute to the SDGs². The published cases show creative transdisciplinary sustainable solutions developed for the 17 goals through nine architectural domains. The relationship matrix, presented in Figure 2, connects architectural domains with the SDGs based on evidence found in various cases.

² Case studies are taken from (Institute of Architecture and Technology (KADK) et al., 2018, 2020)



Figure 2. The relationship matrix between the architectural domains and the SDGs extracted from the cases studied

CONCLUDING REMARKS

This paper explores how sustainable development can be accelerated in the built environment by analyzing the sustainable value of architecture as the tying thread that connects the different disciplines of the construction and building industries. The theoretical exploration in design, creativity, and transdisciplinarity revealed that architecture is well-positioned to mediate between the disciplines involved in the building industry, optimize their contribution, and accelerate sustainable development in the built environment by intersecting sustainability principles and creativity through transdisciplinarity. The paper offered a descriptive framework for these findings and exemplified it using a series of architectural case studies presenting innovative transdisciplinary solutions to some SDGs.

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